1188490 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1

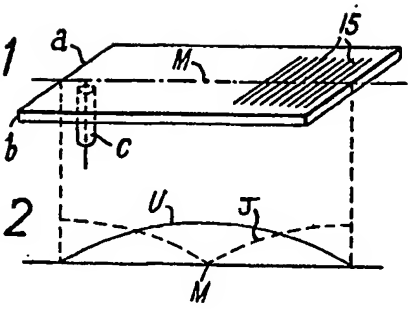

FIG. 2

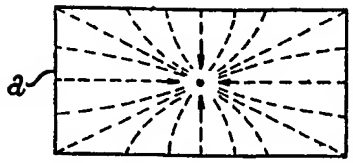

FIG. 3

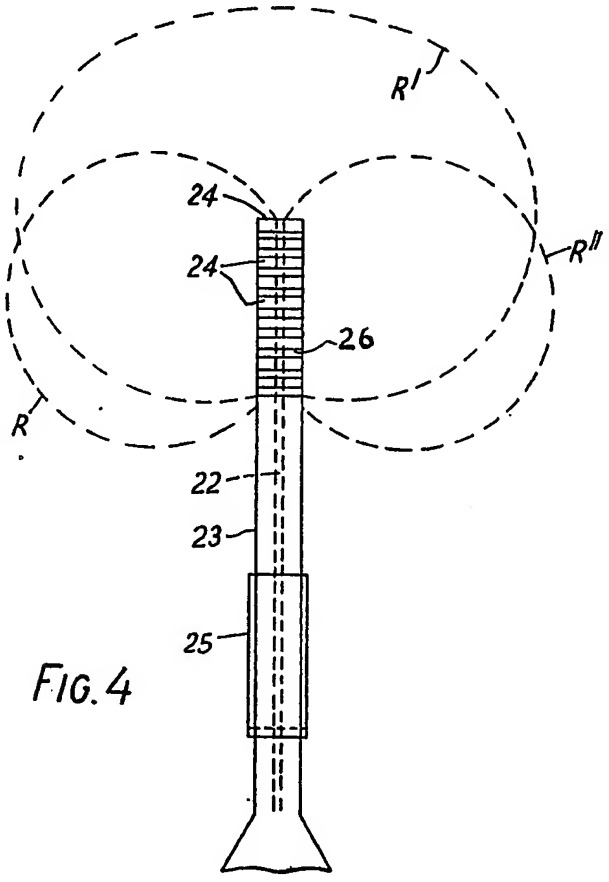

FIG. 4

Description

COMPLETE SPECIFICATION
Electrodes and Microwave Therapy
I, RARL FRITZ, a German citizen, of Wenddsteinstrasse 26, Wiesbaden, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:
The invention relates to microwave electrodes or antennae for medical purposes, that is, for directing radiation to a desired part of the human body. In consequence of the new form of the electrodes it is possible to open up new fields of application for microwaves in the medical sector. It is possible to direct the radiating energy to a welldefined spot to be treated 50 that no energy is lost and the total energy generated by the set can be kept low. Whereas the sets at present in use have a power of about 100 to 150 watts or even more the power required for electrodes according to the invention is only about 10 watts. This enables small microwave therapeutic sets to be made weighing only about 3 pounds whereas the known sets have a weight of at least 30 pounds.

According to the present invention there is provided medical apparatus including a microwave electrode for directing radiation to a part of the human body, the electrode being of flexible form and comprising means for feeding microwaves of wavelength A to an array of slot radiators in an electricallyconducting member, the slots having a width of A/100 or less and being spaced apart by A/10 or less.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:
Fig. 1 is a perspective view of one embodiment of the invention,
Figs. 2 and 3 are diagrams showing respectively the current and voltage distribution in the electrode, and
Fig. 4 shows another embodiment of the invention.

In Fig. 1 a microwave electrode for directing radiation to a part of the human body comprises a resonant cavity excited by a coaxial cable C delivering microwaves of wavelength J. The cavity shown has a lenl of A/2 and is formed by a rectangular box of flexible metal sides in which the depth is small compared with the length and breadth as shown.

In one of the broader walls as shown, there is a linear array of slots 15. They have a width of A/1OO or less and are spaced from one another by A/10 or less. Practical values are, for instance, a width of A/500 and a spacing of A/50. The slots may be closed by dielectric material so that a smooth water and air-tight surface is provided.

The cavity may be filled with a flexible dielectric material or a number of foils of dielectric material which can slide upon one another when the electrode is flexed.

The whole electrode has the appearance of a heating pad and is flexed to a part of the human body to he irradiated.

Figs. 2 and 3 show, with reference to the mid-point M of the A/2 cavity, the distribution of current J and voltage U.

Fig. 4 shows a further embodiment of the invention which is of flexible rod form. A flexible rod 26 of dielectric material has a coaxial conductor 22 therein. Surrounding the dielectric rod is a sheath 23 supported by the rod and containing an array of circumferential slots 24 corresponding to the slots 15 of the embodiment of Fig. 1.

The end of the radiator can be closed off by an end plate, in which case the radiation pattern is lateral as shown by the pattern
R". However, the end plate can also have slots therein whereby end-wire or axial radiation can also take place as shown by the pattern R'.

A wave trap 25 can be provided in the form of a cylinder surrounding the input-end of the radiator. This reduces the flow of energy along the outer conductor towards the handle so that the hand guiding the electrode is not irradiated unduly.

The dielectric rod is of a plastics material which is not detrinental to the skin on the interior of the human body.

The electrode may have a diameter of 1--2 cm or a few millimetres according to its purpose.

WHAT I CLAIM IS:-
1. Medical apparatus including a microwave electrode for directing radiation to a part of the human body, the electrode being of flexible form and comprising means for feeding microwaves of wavelength A to an array of slot radiators in an electrically-conducting member, the slots having a width of A/100 or less and being spaced apart by I/1U or less.

2. Apparatus according to claim 1, wherein the flexible electrode is in the form of a

resonant cavity having flexible walls, the depth of the cavity being small compared with the length and breadth of the cavity and the array of slots being formed along one of the two broader faces of the cavity.

3. Apparatus according to claim 2, wherein the cavity is filled with flexible dielectric material.

4. Apparatus according to claim 1, wherein the flexible electrode comprises a rod of flexible dielectric material with a conductor co-axial therein and a flexible metal sheath, the array of slots being in the forwn of circumferential slots in the sheath.

5. Apparatus according to claim 4, wherein the end of the rod electrode is closed by a metallic member.

6. Apparatus according to claim 4, wherein the end of the rod has a transverse metallic end plate in which further radiating slots are provided.

7. Medical apparatus including a microwave electrode for directing radiation to a part of the human body, substantially as hereinbefore described with reference to Fig.

1 or Fig. 4 of the accompanying drawings.

WARNING end of DESC field may overlap start of CLMS **.

No English title available.

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IPC Classification:
EC Classification: A61N5/04
Equivalents:

Abstract

1,188,490. Treating with radiations. K. FRITZ. 16 March, 1967, No. 61188/69. Divi- ded out of 1187019. Heading A5R. [Also in Divisions H4] A microwave radiator device for medical use comprises a flexible rod 26, Fig. 4, of dielectric material, in which is a co-axial con- ductor 22. Surrounding the rod 26 is a sheath 23 containing an array of circumferential slots 24. Power at a wavelength is fed to the device, the width of the slots 24 being # or 100 less, and their spacing from each other being # or less. The end of the device may be closed 10 by an end plate, when the radiation pattern is lateral as shown at R". If slots are pro- vided in the said end plate, axial radiation also takes place, as shown at R'. A wave- trap 25 prevents radiation towards the input end of the device. In another embodiment (Fig. 1, not shown) a flat flexible box or cavity has an array of slots in a broad wall, and it is excited by a co-axial cable. The cavity may be filled either with a flexible dielectric mate- rial or with a number of dielectric foils which can slide over one another. The slots may also be filled with dielectric material.